WHAT IS CLAIMED IS:

1. A method of manufacturing pores having controlled geometries and locations comprising the steps of:

forming a first channel in a first member, including using fabrication techniques that enable formation of a first channel-defining layer having a well controlled thickness and including removing at least a region of said first channel-defining layer to form said first channel so as to have a controlled geometry in a thickness direction of said first channel-defining layer;

forming a second channel in a second member, including using said fabrication techniques to form a second channel-defining layer having a well controlled thickness and including removing at least a region of said second channel-defining layer to form said second channel so as to have a controlled geometry in a thickness direction of said second channel-defining layer;

positioning said first member relative to said second member such that said first channel is in alignment with said second channel in at least one location, thereby defining a location of said pore; and

enabling fluid communication between said first and second channels via said pore.

2. The method of claim 1 wherein each said step of forming said first and second channels includes forming an exterior region having a sequence of layers and includes removing at least a portion of an interior layer of each said sequence to define said first and second channels, each said first and second channel having a longitudinal dimension that is perpendicular to a thickness of said interior layer that was removed, said step of positioning said first member including aligning said first and second channels such that said longitudinal dimensions are non-parallel, said pore having dimensions determined by said thicknesses of said interior layers and by a non-parallel relationship of said first channel relative to said second channel, said interior layers of sequences being said first and second channel-defining layers.

3. The method of claim 1 wherein said step of forming said first channel comprises the steps of:

providing said first member as a first multi-layer segment having a first substrate layer;

forming said first channel-defining layer having said well controlled thickness on a top surface of said first substrate layer;

forming a first top layer having a controlled thickness on a side of said first channel-defining layer opposite said first substrate layer;

selectively removing a portion of at least one of said first substrate layer and said first top layer, thereby creating a first supply conduit; and

forming a first path through said first channel-defining layer from said first supply conduit to an edge of said first substrate layer.

4. The method of claim 3 wherein said step of forming said second channel comprises the steps of:

providing said second member as a second multi-layer segment having a second substrate layer;

forming said second channel-defining layer having said well controlled thickness on a top surface of said second substrate layer;

forming a second top layer having a controlled thickness on a side of said second channel-defining layer opposite said second substrate layer;

selectively removing a portion of at least one of said second substrate layer and said second top layer, thereby creating a second supply conduit; and

forming a second path through said second channel-defining layer from said second supply conduit to an edge of said second substrate layer.

5. The method of claim 4 wherein said step of positioning comprises the step of abutting said edge of said first multi-layer segment in non-parallel alignment against said edge of said second multi-layer segment such that said first channel and said second channel are aligned along a minor region of contact between said edges.

6. The method of claim 5 further comprising a step of sealing said edge of said first multi-layer segment to said edge of said second multi-layer segment such that matter introduced into said first supply conduit passes to said second supply conduit via said first channel and said second channel.

7. The method of claim 6 further comprising the steps of:

attaching a first reservoir to said first supply conduit; and

attaching a second reservoir to said second supply conduit.

8. The method of claim 1 wherein said steps of forming said first channel and enabling fluid communication include the steps of:

providing said first member as a first substrate layer;

removing a portion of said first substrate layer to form a first recess having side walls and a base;

forming said first channel-defining layer having said well controlled thickness on at least said side walls and said base of said first recess, thereby defining a first coated tub;

configuring a first top layer within said first coated tub such that a top surface of said first top layer is generally coplanar with said top surface of said first substrate layer;

removing a portion of said first substrate layer via a bottom surface opposite said top surface of said first substrate layer such that said first channel-defining layer is exposed, thereby creating a first supply conduit; and

selectively removing said first channel-defining layer from said first recess, thereby creating a first path extending from said first supply conduit to said top surface of said first substrate layer.

9. The method of claim 8 wherein said step of forming said second channel comprises the steps of:

providing said second member as a second substrate layer;

removing a portion of said second substrate layer to form a second recess having side walls and a base;

forming said second channel-defining layer having said well controlled thickness on at least said side walls and said base of said second recess, thereby defining a second coated tub;

configuring a second top layer within said second coated tub such that a top surface of said second top layer is generally coplanar with said top surface of said second substrate layer;

removing a portion of said second substrate layer via a bottom surface opposite said top surface of said second substrate layer such that said second channel-defining layer is exposed, thereby creating a second supply conduit; and

selectively removing said second channel-defining layer from said second recess, thereby creating a second path extending from said second supply conduit to said top surface of said second substrate layer.

10. The method of claim 9 further comprising a step of bonding said top surface of said first substrate layer to said top surface of said second substrate layer such that said first path and said second path intersect in one location, wherein matter introduced into said first supply conduit passes through said first path to said second path via said one location.

11. The method of claim 10 further comprising the steps of:

attaching a first reservoir to said first supply conduit; and

attaching a second reservoir to said second supply conduit.

12. A method of forming a nanopore comprising the steps of:

forming a first multi-layer segment having a first top layer and a first intermediate layer;

forming a second multi-layer segment having a second top layer and a second intermediate layer;

forming a first channel though said first intermediate layer, said first channel having a longitudinal direction;

forming a second channel through said second intermediate layer, said second channel having a longitudinal direction; and

bonding said first and second multilayer multi-layer segments with said longitudinal directions being misaligned relative to each other such that an intersection of said first channel and said second channel defines boundaries of said nanopore.

13. The method of claim 12 wherein said step of forming said first channel includes the steps of:

(a) etching a portion of at least one of a first supporting semiconductor substrate layer and said first top layer, thereby creating a first supply conduit, said first supply conduit extending from an exterior surface of said first multi-layer segment to said first intermediate layer; and

(b) etching said first intermediate layer from said first supply conduit to an edge of said first multi-layer segment;

and wherein said step of forming said second channel includes the steps of:

(a) etching a portion of at least one of a second supporting semiconductor substrate layer and said second top layer, thereby creating a second supply conduit, said second supply conduit extending from an exterior surface of said second multi-layer segment to said second intermediate layer; and

(b) etching said second intermediate layer from said second supply conduit to an edge of said second multi-layer segment.

14. The method claim 13 further comprising the steps of:

orienting an edge of said first multi-layer segment in a non-parallel manner relative to an edge of said second multi-layer segment such that said first channel and said second channel intersect in a minor region of said edges; and

sealing a portion of said first channel and a portion of said second channel such that matter intended to pass from said first supply conduit to said second supply conduit via said first channel and said second channel must pass through said nanopore.

15. The method of claim 12 wherein said step of forming said first multi-layer segment comprises the steps of:

(a) providing a first semiconductor substrate layer;

(b) etching a portion of said first semiconductor substrate layer to form a first recess having walls extending downwardly from a top surface of said first semiconductor substrate layer;

(c) forming a first intermediate layer having a controlled thickness on at least said walls and a base of said first recess, thereby defining a first coated tub;

(d) providing a first top layer within said first coated tub and exposing a periphery of said first intermediate layer;

(e) etching a portion of a bottom surface opposite said top surface such that said first intermediate layer is exposed, thereby creating a first supply conduit; and

(f) selectively etching said first intermediate layer to create said first channel extending from said first supply conduit to said top surface of said first substrate layer;

and wherein said step of forming said second multilayer wafer comprises the steps of:

(a) providing a second semiconductor substrate layer;

(b) etching a portion of said second semiconductor substrate layer to form a second recess having walls extending downwardly from a top surface of said second semiconductor substrate layer;

(c) forming a second intermediate layer having a controlled thickness on at least said walls and a base of said second recess, thereby defining a second coated tub;

(d) providing a second top layer within said second coated tub and exposing a periphery of said second intermediate layer;

(e) etching a portion of a bottom surface opposite said top surface of said second semiconductor substrate layer such that said second intermediate layer is exposed, thereby creating a second supply conduit; and

(f) selectively etching said second intermediate layer to create said second channel extending from said second supply conduit to said top surface of said second semiconductor substrate layer.

16. The method of claim 15 wherein said step of bonding includes aligning said first and second multi-layer segments such that said first channel intersects said second channel in one location.

17. A method of forming an opening having a well controlled geometry comprising the steps of:

forming a first segment, said first segment including a first top layer having predetermined dimensions, a first intermediate layer having predetermined dimensions and a first base layer, said first intermediate layer being located between said first top layer and said first base layer;

forming a second segment, said second segment including a second top layer having predetermined dimensions, a second intermediate layer having predetermined dimensions and a second base layer, said second intermediate layer being located between said second top layer and said second base layer;

forming a first path in said first intermediate layer;

forming a second path in said second intermediate layer; and

bonding said first segment relative to said second segment such that an intersection of said first path with said second path defines the boundaries of said opening.

18. The method of claim 17 further comprising a step of tailoring properties at said opening by forming an oxide layer along said first and second paths.

19. The method of claim 18 wherein said tailoring step includes introducing at least one of agents and probes into said oxide layer, where said at least one is selected for enabling chemical analysis and characterization of macromolecules, synthetic and naturally occurring, colloidal micro and nanoparticles, based on interactions of such molecules and particles with the nanopore.

20. The method of claim 17 wherein said step of forming said first path comprises the steps of:

(a) etching a first conduit to said first intermediate layer; and

(b) etching said first path through said first intermediate layer from said first conduit to an edge of said first segment;

and wherein said step of forming said second path includes the steps of:

(a) etching a second conduit to said second intermediate layer; and

(b) etching a second path through said second intermediate layer from said second conduit to an edge of said second segment;

said method further comprising the steps of:

(a) orienting said edge of said first segment in a non-parallel manner relative to said edge of said second segment such that said first path and said second path are aligned in one location; and

(b) sealing a portion of said first path and a portion of said second path such that matter intended to pass from said first conduit to said second conduit via said first path and said second path must pass through said opening.

21. The method of claim 17 wherein said step of forming said first segment comprises the steps of:

(a) forming a first recess within said first segment, said first recess having walls extending downwardly from a top surface of said first segment;

(b) forming said first intermediate layer having a controlled thickness at least on said walls and a base of said first recess, thereby defining a first tub;

(c) filling said first tub with a first top layer such that a top surface of said first top layer is coplanar with said top surface of said first segment;

(d) removing a portion of said first segment from a bottom surface opposite said top surface such that said first intermediate layer is exposed, thereby creating a first conduit; and

(e) selectively removing said first intermediate layer to form said first path extending from said first conduit to said top surface of said first segment;

and wherein said step of forming said second segment comprises the steps of:

(a) forming a second recess within said second segment, said second recess having walls extending downwardly from a top surface of said second segment;

(b) forming said second intermediate layer having a controlled thickness at least on said walls and a base of said second recess, thereby defining a second tub;

(c) filling said second tub with said second top layer such that a top surface of said second top layer is coplanar with said top surface of said second segment;

(d) removing a portion of said second segment from a bottom surface opposite said top surface of said second segment such that said second intermediate layer is exposed, thereby creating a second conduit; and

(e) selectively removing said second intermediate layer to form said second path extending from said second conduit to said top surface of said second segment;

and wherein said step of bonding includes bonding said top surface of said first segment to said top surface of said second segment such that said first path and said second path are aligned at one location, said one location being a nanopore.

22. A nanopore-defining device comprising:

a first multi-layer segment having a sequence of layers that includes two layers that are spaced apart to define a first surface slot having a first longitudinal direction, said first multi-layer segment having an interior path to said first surface slot; and

a second multi-layer segment having a sequence of layers that includes two layers that are spaced apart to define a second surface slot having a second longitudinal direction, said second multi-layer segment having an interior path to said second surface slot,

wherein said first and second multi-layer segments are connected such that said first surface slot is adjacent to and in fluid communication with said second surface slot, while said first longitudinal direction is misaligned with said second longitudinal direction.

23. The nanopore-defining device of claim 22 wherein said first and second surface slots extend along edges of said first and second multi-layer segments, respectively, said first and second surface slots being channels defined by partially etched interior layers, said edges being bonded to each other in a non-parallel relationship, said first longitudinal direction being coincident with a length of said edge of said first multi-layer segment, said second longitudinal direction being coincident with a length of said edge of said second multi-layer segment.

24. The nanopore-defining device of claim 22 wherein each of said first and second multi-layer segments includes a substrate layer having opposed major first and second sides, each of said first and second surface slots being along the respective first side and extending into the respective first and second multi-layer segment at an angle to said respective first side, said first side of said first multi-layer segment being bonded to said first side of said second multi-layer segment.

25. The nanopore-defining device of claim 24 wherein said two layers that are spaced apart to define said first surface slot are said substrate layer and a second layer that is seated within said substrate layer of said first multi-layer segment, said second layer having a major surface region that is substantially coplanar with said first side of said substrate layer of said first multi-layer segment.

26. The nanopore-defining device of claim 25 wherein said two layers that are spaced apart to define said second surface slot are said substrate layer and a second layer that is seated within said substrate layer of said second multi-layer segment, said second layer of said second multi-layer segment having a major surface region that is substantially coplanar with said first side of said substrate layer of said second multi-layer segment.

27. A method of forming a pore comprising the steps of:

forming members having elongated slots; and

connecting said members so that said elongated slots are adjacent and are intentionally oriented into a non-parallel relationship to each other such that said pore has dimensions that are defined by a partial overlap of said elongated slots.

28. The method of claim 27 wherein said step of connecting sets a maximum cross sectional dimension of said pore at 0.1 millimeter.

29. The method of claim 27 wherein said step of connecting is implemented such that said elongated slots are more orthogonal than parallel.

30. The method of claim 27 wherein said step of forming includes providing said elongated slots along edges of said members and includes providing flow paths between said elongated slots and openings into interiors of said members.

31. The method of claim 27 wherein said step of forming includes providing said elongated slots along generally planar major surfaces of said members and wherein said step of connecting includes bonding said members to each other along said generally planar major surfaces.